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ABSTRACT

This report describes the development and validation of the Unisex ACT Interest Inventory (UNIACT). In contrast to other interest inventories in common use, the UNIACT contains scales on which males and females receive similar scores. In the development of the UNIACT, more than 200 potentially sex-balanced items were administered to 10,211 people, including 9th graders, 11th graders, college-bound students, college sophomores, and adults. The instrument resulting from the item tryouts consists of 90 items assigned to scales assessing the six Holland types and two underlying dimensions of work-related activity preferences--a data/ideas dimension and a things/people dimension. Scale distributions are highly similar for males and females, as evidenced by a median overlap of 92 percent. The goal was achieved with no loss in the technical quality of the instrument. The median coefficient alpha reliability estimates for the six scales assessing Holland types is .87. The scales intercorrelate according to theoretical expectations and exhibit the appropriate theory-based factor structure. Criterion-related validity data from a number of studies are summarized in the form of three-scale, high-point codes for 152 educational and vocational criterion groups. (Author/MV)

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DEVELOPMENT AND VALIDATION OF SEX-BALANCED INTEREST INVENTORY SCALES

ABSTRACT

This report describes the development and validation of the Unisex ACT Interest Inventory (UNIACT). In contrast to other interest inventories in common use, the UNIACT contains scales on which males and females receive similar scores. In the development of the UNIACT, more than 200 potentially sex-balanced items were administered to six samples (N = 10,211) including 9th graders, 11th graders, college-bound students, college sophomores, and adults. The instrument resulting from the item tryouts consists of 90 items assigned to scales assessing the six Holland types and two underlying dimensions of work-related activity preferences—a data/ideas dimension and a things/people dimension. Scale distributions are highly similar for males and females, as evidenced by a median overlap of 92%. This goal was achieved with no loss in the technical quality of the instrument. The median coefficient alpha reliability estimates for the six scales assessing Holland types is .87. The scales intercorrelate according to theoretical expectations and exhibit the appropriate theory-based factor structure. Criterion-related validity data from a number of studies are summarized in the form of three-scale, high-point codes for 152 educational and vocational criterion groups (N = 26,656).

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DEVELOPMENT AND VALIDATION OF SEX-BALANCED INTEREST INVENTORY SCALES

Gary R. Hanson
Dale J. Prediger
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Vocational interest inventories have long been used to help people think about possible careers. Such inventories work well because different people give different responses to individual items and because people who have found satisfying work in a particular occupation respond to specific items in a characteristic way (Campbell, 1974). The very strength of interest inventories is that they provide a link between personal information about an individual (e.g., preferences for certain work-related activities, school subjects, etc.) and the characteristics of satisfied people pursuing various occupations or educational programs. This link can be used to facilitate the career exploration process by suggesting possible career directions for consideration. Because of their widespread use, vocational interest inventories have the potential for affecting the career directions taken by large numbers of men and women.

It is understandable, then, that interest inventories have been criticized when they have not provided an equal opportunity for both men and women to explore the full range of occupational options (see Huth, 1973; Schlossberg & Goodman, 1972). Yet, men and women do respond to traditional interest inventory items in characteristically different ways. For example, most men but only a small percentage of women say they would like to "repair an automobile" while a large number of women but only a few men say they would like to "care for small children." These sex differences have been well documented in the research literature. About one-half of the items on traditional interest inventories show more than a 15 percentage point difference in the "like" responses of men and women (Hanson, 1974; Johansson, 1976; Johansson & Harmon, 1972). According to Campbell (1974), "the problem confronting those responsible for interest inventories is how to deal with the differences that do occur—so that the unique qualities of every individual of either sex can be addressed by the scoring system—without using the group differences to restrict the choices of any one person" (p. 69).

The general purpose of this study is to describe the development and initial validation of a vocational interest inventory designed to provide sex-fair career suggestions to both men and women. More specifically, the focus is on the development and validation of homogeneous scales assessing basic types of interests. Such scales are commonly used in interest inventories; examples include the Vocational Preference Inventory (VPI), the Kuder General Interest Survey, and the Basic Interest Scales of the Strong-Campbell Interest Inventory (SCII).

Sex-restrictive Versus Sex-balanced Reporting Procedures

In the past, procedures used for reporting scores for homogeneous interest scales have treated sex differences in item responses in one of two ways. The first reporting procedure takes the sex differences at face value. That is, the differences are assumed to indicate that men and women are suited for different types of occupations. Raw scores or combined-sex norms are used to report a person's scores and, as a result, men and women receive widely divergent career suggestions (Cole & Hanson, 1975; Gottfredson, Holland, & Gottfredson, 1975; Prediger & Hanson, 1976). Such reporting procedures have been called *sex-restrictive* (Prediger & Hanson, 1974).

The second procedure for reporting scores views sex differences in the responses to many items, especially those with obvious sex-role connotations, as reflecting the effects of sex-role socialization without necessarily reflecting differences in basic interests. This procedure recognizes that men and women interested in similar career-related activities may respond quite differently to interest inventory items with sex-role connotations (e.g., "Would you like operating a power shovel? Repairing a hot rod? Arranging flowers?"). Typically, same-sex norms are used to take into consideration the effects of sex-role socialization on item responses. Interest reports based on same-sex norms use the interest scores of members of the appropriate sex as a base line for assessing the relative strength of interests. As a result, similar *(sex-balanced)* career suggestions are provided to men and women (Cole & Hanson, 1975; Gottfredson et al., 1975; Prediger & Hanson, 1974). Any reporting procedures providing similar career suggestions to men and women may be called *sex-balanced.*

Because of the differences in the career guidance provided by the two procedures for reporting interest results, it is important to review the research evidence concerning the outcomes and viability of each procedure.

Review of Research on Interest Inventory Reporting Procedures

Reporting Procedures Based on Raw-Score and Combined-Sex Norms

Several recent research studies have shown that various interest inventory reporting procedures provide dramatically different distributions of career suggestions to men and women (see Cole & Hanson, 1975; Gottfredson et al., 1975; Prediger & Hanson, 1974, in press). Interest inventories which report raw scores or standard scores based on combined-sex norms typically suggest technical, scientific, and business careers more frequently to men than women, and social service, artistic, and clerical careers more frequently to women than men. Although it is possible to eliminate sex-restrictiveness in score reports through the use of same-sex norms, the key question is whether sex-restrictive reporting procedures can be justified on the basis of validity evidence.

Holland and his co-workers maintain that interest score reports must be sex-restrictive to be valid. For example, Gottfredson et al. (1975) argue that the interest score distributions of men and women should correspond to the occupational distributions of men and women. That is, the proportion of women (or men) referred to an occupational field by an interest inventory should correspond to the proportion of women (or men) currently employed in that field. Holland and his co-workers demonstrate that sex-restrictive raw scores approximate this criterion far better than sex-balanced scores (e.g., scores based on same-sex norms) and thus presumably support the validity of raw scores. However, Prediger and Cole (1975) raise serious questions about the theoretical and psychometric bases for using employment distributions as criteria for judging the validity of distributions of human interests.

In another study, Gottfredson and Holland (1975) compare the criterion-related validity of Self-Directed Search (SDS) raw scores and normed scores (same-sex norms) in predicting the vocational preferences of college students. Even if one agrees that the purpose of interest inventories is to predict vocational preference, the results obtained by Gottfredson and Holland appear to be ambigu-

ous. Raw scores and normed scores were equally effective predictors for males. Although raw scores provided more accurate predictions than normed scores for females, both sets of predictions were less accurate then predictions based on criterion group size (i.e., the base rates). These latter predictions ignore SDS scores. Finally, current occupational preference was a better predictor of future preference than the SDS for both males and females. Although this latter finding is not surprising, since current preferences consistently predict future preferences better than do interest inventories (Gottfredson & Holland, 1975; Holland, 1973; Whitney, 1969), it does imply that interest inventories may be of little practical value to counselors who want to predict the future vocational preferences of their counselees.

Reporting Procedures Based on Same-Sex Norms

As noted above, a common procedure for dealing with the sex differences in item responses is to convert raw scores to standard scores separately by sex (i.e., use same-sex norms). Interest reports based on same-sex norms take into account the effect of sex role expectations on item responses by using the scores of members of the appropriate sex as a base line for assessing the relative strength of interests. Thus, a woman whose mechanical interests are high relative to those of other women is reported to have high mechanical interests since her interests are exceptional, given the social norms for female behavior in our society. When same-sex norms are used to report interest inventory results, similar proportions of males and females receive their highest scores for a given occupational area (e.g., business management, social work, natural science, etc.). Studies comparing the validity of this reporting procedure with the validity of sex-restrictive procedures are summarized below. First, however, the question, "validity for what?" requires consideration.

It is widely recognized that the validity of a measuring instrument depends on the purposes for which it is used. Prediger (in press) has argued that rather than validating the use of interest inventories in predicting future occupational preferences or occupational entry, it is more appropriate to validate their use in suggesting career options for counselees to consider. Few counselors, it has been noted (Berdie, 1970), are interested in predicting which occupation a counselee will enter or prefer. Yet, this criterion is commonly used in interest inventory validation studies.

When the "should consider" criterion is used in a validation study, one would expect an interest inventory to suggest engineering to a large number of engineers, nursing for a large number of nurses, and so on for each of the available criterion groups. Using this approach to interest inventory validation, Prediger (in press) reanalyzed the Gottfredson-Holland data for college women and found that the validities of raw scores and same-sex normed scores did not differ. Hit rates averaged approximately 40% for both types of scores. ACT Interest Inventory (ACT-IV) data for a national sample of college seniors (5,517 men and 5,061 women) in the same 18 majors also showed that the criterion-related validity of normed scores is equal to or greater than that of raw scores (Prediger & Hanson, in press). For males, the average hit rate for high-point code predictions of college majors grouped by Holland type was 55% for standard scores (same-sex norms) and 53% for raw scores. For females, the hit rate was 51% for standard scores and 44% for raw scores. When centour scores based on discriminant functions were used, the hit rates for normed scores and raw scores were essentially the same.

The criterion-related validity of several different interest inventory reporting procedures was examined using 3-year and 5-year longitudinal data from two studies (Hanson, Noeth, & Prediger, in press). The first study involved 1,073 students who began community college in the fall of 1970 and who were subsequently surveyed during the spring and summer of 1975. Students were categorized into criterion groups corresponding to Holland types on the basis of current employment or employment plans. Most of the individuals in the latter category (20% of the total group) were still enrolled in college. High-point codes based on each individual's 1970 results from the Vocational Interest Profile (VIP), an alternative form of the ACT-IV, were matched against criterion group membership. A "hit" was tallied if the student's highest score in 1970 corresponded to the student's criterion group. The unweighted average hit rates were higher for scores based on same-sex norms than for raw scores for both men (38% vs. 33%) and women (44% vs. 36%). For women, same-sex norms produced higher hit rates than combined-sex norms and opposite-sex norms. For men, same-sex norms were superior to opposite-sex norms and were equal in effectiveness to combined-sex norms.

The second longitudinal study involved 1,443 college-bound students who took the ACT-IV in the

fall of 1972 and were subsequently surveyed during the spring of 1975. ACT-IV high-point codes were matched against college major categorized by Holland types. For males, the unweighted average hit rates were similar for reports based on same-sex norms (43%), raw scores (42%), and combined-sex norms (40%). For females, same-sex and combined-sex norms produced identical hit rates (39%), both superior to raw scores (33%). Data for opposite-sex norms were not examined.

The results of these two longitudinal studies, the Prediger-Hanson study, and the reanalysis of the Gottfredson-Holland data indicate that for common criteria, the criterion-related validity of scores based on same-sex norms is equal to or greater than that of the other reporting procedures. This finding is especially important since raw scores, combined-sex norms, and opposite-sex norms all provide highly stereotypic career suggestions to males and females, whereas same-sex norms do not.

Three comparisons of the construct validity of the various reporting procedures have also been completed. The first study (Prediger & Hanson, 1976) involved more than 39,000 men and women pursuing the same 104 occupations. Differences in the raw score profiles of men and women pursuing the same occupations were substantial, systematic, and stereotypic. When same-sex norms were used, the profiles of men and women were much more similar—in accordance with expectations based on Holland's theory of careers (Holland, 1976; Prediger & Hanson, 1976). In a closely related study involving a sample of 10,500 college seniors, ACT-IV profiles for males and females in the same 18 majors were also found to be more similar when same-sex norms were used (Hanson, Note 1). In the third study (Prediger, 1976b, 1976c) bearing on the construct validity of sex-restrictive and sex-balanced score reports, sex-balanced normed scores produced personality pattern distributions more in line with expectations based on Holland's consistency construct than did sex-restrictive raw scores. Results were replicated across seven samples of high school students, college students, and adults, and four different interest inventories. More than 18,000 males and 20,000 females were involved. Finally, several studies show that persons in various college majors (ACT, 1977; Hanson, 1974; Schussel, 1975), occupational preference groups (ACT, 1974), and occupations (Prediger & Hanson, 1976) obtain sensible score profiles when sex-balanced score reports are used. A recent study by Lamb (1975) suggests that sex-balanced score reports are appropriate for use with males and females in various minority groups.

Considered as a whole, these studies indicate that sex-balanced reporting procedures which use same-sex norms have criterion-related validity equal to or greater than sex-restrictive reporting procedures (e.g., procedures using raw scores or combined-sex norms). With equal or greater validity and with the desirable feature of providing similar distributions of career suggestions to men and women, sex-balanced reporting procedures are appealing. However, some claim same-sex norms "treat men and women differently" and hence, are "unfair." Furthermore, the psychometric basis for using same-sex norms is often difficult to explain to counselors and other professionals. Yet another disadvantage of norming separately by sex is that some people may ask for score reports based on opposite-sex norms in addition to same-sex norms. Unfortunately, the dual score reports provide contradictory information—an outcome that is confusing and potentially harmful to counselees. With these disadvantages, the development of alternatives to the use of same-sex norms or other statistical adjustments to achieve sex balance in interest reports appears to be necessary.

Reporting Procedures Based on Sex-balanced Scales

One way to avoid the misunderstandings sometimes associated with the use of same-sex norms is to eliminate sex differences in the interest inventory raw scores themselves, and thus make same-sex norms unnecessary. Because the responses to individual items provide the basis for raw scores, attempts to construct sex-balanced raw score scales (i.e., raw score scales on which males and females obtain similar scores) mainly involve finding potentially sex-balanced items that tap the desired interest constructs. Typically, the responses to about half of the items in current interest inventories are approximately sex-balanced (Campbell, 1974; Harmon, 1975; Johansson, 1976). Thus, interest inventories can be revised by replacing items that elicit large male-female response differences with sex-balanced items which have the appropriate psychometric characteristics.

It is clear from the work of Holland and Gottfredson that minor revisions in the wording of items typically used in interest inventories are not likely to have an appreciable effect on the raw score distributions of males and females. For example,

Gottfredson (1976) found essentially no differences in the responses of 94 high school girls to four "sexist" and four "neutral" occupational titles (e.g., policeman and police officer). On this basis, Gottfredson concluded that his approach to modifying current items will not change overall raw scores to any practical degree. Holland and Gottfredson (1976) examined the effect of replacing 12 of 22 SDS Realistic scale items rarely endorsed by women and items foreign to their experience with items thought to be sex-neutral (e.g., prefer to take a shop or sewing course). They found that the Realistic scale scores of women were significantly and substantially increased. However, the distribution of SDS high-point codes did not change, probably because of methodological limitations in the study. As the authors pointed out, "women usually get such high scores on the social, artistic, and conventional scales that only a great change in their realistic scale scores would change their SDS code" (p. 225). Holland and Gottfredson did not try to revise the other scales. In addition, several Realistic scale items likely to produce sex differences were not revised. Finally, only 2 of the 12 items written for the study appeared to measure the intended construct. These two studies show that attempts to modify a few of the items typically included in interest inventories will probably have little effect on the career options suggested to men and women.

No attempt was made in either of the above studies to write and pretest items endorsed in equal proportions by men and women or to develop raw score scales providing similar distributions of career options for men and women. However, a recent study by Rayman (1976) demonstrated that interest inventory items on which there are only minor sex differences can be written and that interest scales developed from such items possess psychometric characteristics (e.g., scale homogeneity) similar to those of scales containing items that elicit large sex differences. Rayman constructed potentially sex-balanced items for each of Holland's six types. Following a pretest with 220 high school seniors, the items were administered along with the ACT-IV to a national sample of 1,902 college-bound students. In contrast to ACT-IV raw scores, Rayman's Unisex Interest Inventory (UNI-II) raw scores did not exhibit the large sex differences typically found. Nevertheless, the pattern of interscale correlations for the UNI-II corresponded to the hexagonal configuration expected for Holland types and correlations between the UNI-II scales and the ACT-IV scales showed the appropriate convergent and discriminant validity.

Finally, Hanson and Rayman (1976) recently reported the results of a criterion-related validity study comparing the raw score scales from the ACT-IV and the UNI-II. Six criterion groups for males (N = 502) and five for females (N = 876) were formed by categorizing the current vocational preferences of a national sample of college-bound students tested in April, 1974. When centour scores based on discriminant functions were used to obtain group membership predictions, the average hit rates for the two types of raw score scales were essentially the same for both males and females.

Because the use of sex-balanced interest inventory items is in accordance with the National Institute of Education Guidelines for Assessment of Sex Bias and Sex Fairness in Career Interest Inventories (Diamond, 1975), and because this procedure makes it possible to use a combined-sex norms table without restricting the occupational options suggested to either sex (as would typically be the case; e.g., see Cole & Hanson, 1975), ACT decided in the spring of 1974 to explore the development of a form of the ACT-IV based on sex-balanced items. Subsequent to the work of Rayman (1976), ACT researchers conducted six studies of the characteristics of potentially sex-balanced interest inventory items. As described in the sections that follow, more than 10,000 persons—including ninth graders, eleventh graders, college-bound students, college sophomores, and adults—were involved in the development and validation of the new Unisex ACT Interest Inventory (UNIACT).

Overview of the Unisex ACT Interest Inventory

Rationale

The development of any assessment instrument is based on certain assumptions and purposes; the Unisex ACT Interest Inventory (UNIACT) is no exception. This section outlines the assumptions underlying the UNIACT, describes its general characteristics, and discusses its intended uses.

The major purpose of the UNIACT is to stimulate career exploration and the exploration of self in relation to careers. As career choices become more complex and as work becomes less visible, one of the most difficult tasks faced by adolescents is the identification of career options appropriate to personal goals and characteristics. A major task of career guidance is to provide students with a panoramic view of their options in the worlds of work and education and then to help them find their way in these worlds. Perhaps the term most appropriate for this task is "focused exploration" (Prediger, 1974). The UNIACT can be used to provide focus to career exploration—not a focus that singles out the "right" occupation for Johnny or Susie, but rather one which points to regions of the world of work they may want to visit or explore. In the process of exploration, students will discover new things about themselves and the world of work, things they may not have otherwise considered.

In order to facilitate self-exploration, the UNIACT reports results for scales assessing basic types of vocational interests. Through the use of a comprehensive occupational classification system and well-known, powerful statistical procedures seldom applied to the field of interest assessment, these scales are linked to all occupations in the world of work. Thus, the need to develop (and interpret) specific interest scales, occupation by occupation, is eliminated.

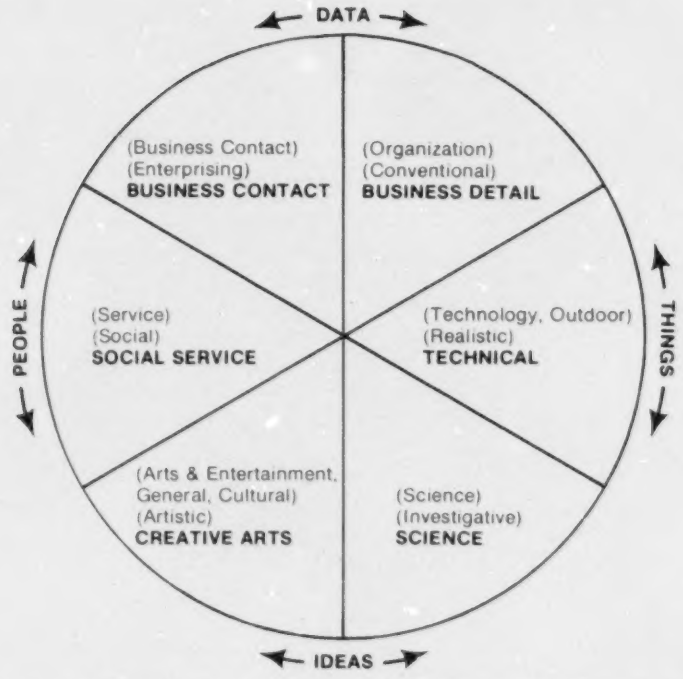
UNIACT Scales and Reporting Procedures

Roe (1956), Roe and Klos (1969), and Holland (1973) have suggested that occupations and vocational interests can be represented by a relatively small number of groups or dimensions. The ACT Interest Inventory in its various forms (ACT, 1974; ACT, 1977; Hanson, 1974) uses the typology proposed by Holland (1973) for its underlying theoretical structure. The UNIACT scales were developed to parallel those on the ACT-IV. These scales are listed in the next column with the corresponding Holland types. A more detailed definition of the scales is provided elsewhere (Hanson, 1974).

In addition to the six scales assessing basic types of interests, the UNIACT contains summary scales assessing two basic dimensions of work-related activity preferences—a data/ideas dimension and a things/people dimension. The UNIACT Data/Ideas and Things/People scales are based on extensive research (ACT, 1977; Hanson, 1974; Prediger, 1976a) on the structure of interests and occupations which indicates that the dimensions underlying Holland's six types can be summarized by two bipolar factors. As shown in Figure 1, these two bipolar factors are compatible with the circular ordering of interests and occupations proposed by Roe (1956) and Holland (1973). A more detailed description of the two bipolar dimensions is provided in Figure 2. The UNIACT uses scores on these dimensions to link a person's preferences to occupational options through the World-of-Work Map (Prediger, 1976a), shown in Figure 3.

ACT-IV and UNIACT Scales	Corresponding Holland Types
Science	Investigative
Creative Arts	Artistic
Social Service	Social
Business Contact	Enterprising
Business Detail	Conventional
Technical	Realistic

In the *Vocational Interest, Experience, and Skills Assessment* (VIESA) program (ACT, 1976), UNIACT is hand-scored and the Data/Ideas and Things/People scores are calculated directly from the item responses. The World-of-Work Map is presented as a two-dimensional grid on which students may plot their positions and note in which regions they are located. In the ACT Assessment Program, an individual is provided a region indicator obtained by applying appropriate factor weights to the standard scores for the six scales corresponding to the Holland types. A student's region (or area of the map) is provided instead of an exact location. In both reporting procedures, a person's World-of-Work Map region is used in conjunction with the ACT Occupational Classification System to identify job families and specific occupations for exploration. The associated Job Family Charts, which list occupations employing more than 95% of the U.S. labor force, provide a simple yet comprehensive overview of the world of work. Further description of the ACT Occupational Classification System, the Job Family Charts, the World-of-Work Map, and their uses is provided by Hanson (1974) and Prediger (1976a).



Note. Roe and Holland types corresponding to UNIACT scales are shown in parentheses. Roe titles appear first.

Figure 1. Relationship between data/ideas and things/people work task dimensions, the UNIACT interest scales, and the Holland and Roe occupational typology

DATA/IDEAS DIMENSION

Data (Facts, records, files, numbers; systematic procedures for facilitating goods/services consumption by people). "Data activities" involve *impersonal processes* such as recording, verifying, transmitting, and organizing facts or data representing goods and services. Purchasing agents, accountants, and air traffic controllers work *mainly* with data.

Ideas (abstractions, theories, knowledge, insights, and new ways of expressing something—for example, with words, equations, or music). "Ideas activities" involve *intrapersonal processes* such as creating, discovering, interpreting, and synthesizing abstractions or implementing applications of abstractions. Scientists, musicians, and philosophers work *mainly* with ideas.

THINGS/PEOPLE DIMENSION

Things (machines, mechanisms, materials, tools, physical and biological processes). "Things activities" involve *nonpersonal processes* such as producing, transporting, servicing, and repairing. Bricklayers, farmers, and engineers work *mainly* with things.

People (no alternative terms). "People activities" involve *interpersonal processes* such as helping, informing, serving, persuading, entertaining, motivating, and directing—in general, producing a change in human behavior. Teachers, salespersons, and nurses work *mainly* with people.

All occupations involve some work with data, ideas, things, and people. The examples listed above were chosen with an emphasis on the primary purpose or focus of the job activities. For example, a scientist may work with data, but the primary purpose is *not* to produce or handle data; rather it is to create or apply scientific knowledge. Likewise, an accountant may work with ideas, but the ultimate goal is *not* to create ideas; rather it is to organize, record, and verify data in a systematic manner.

Figure 2. Definitions of the data/ideas and things/people work task dimensions

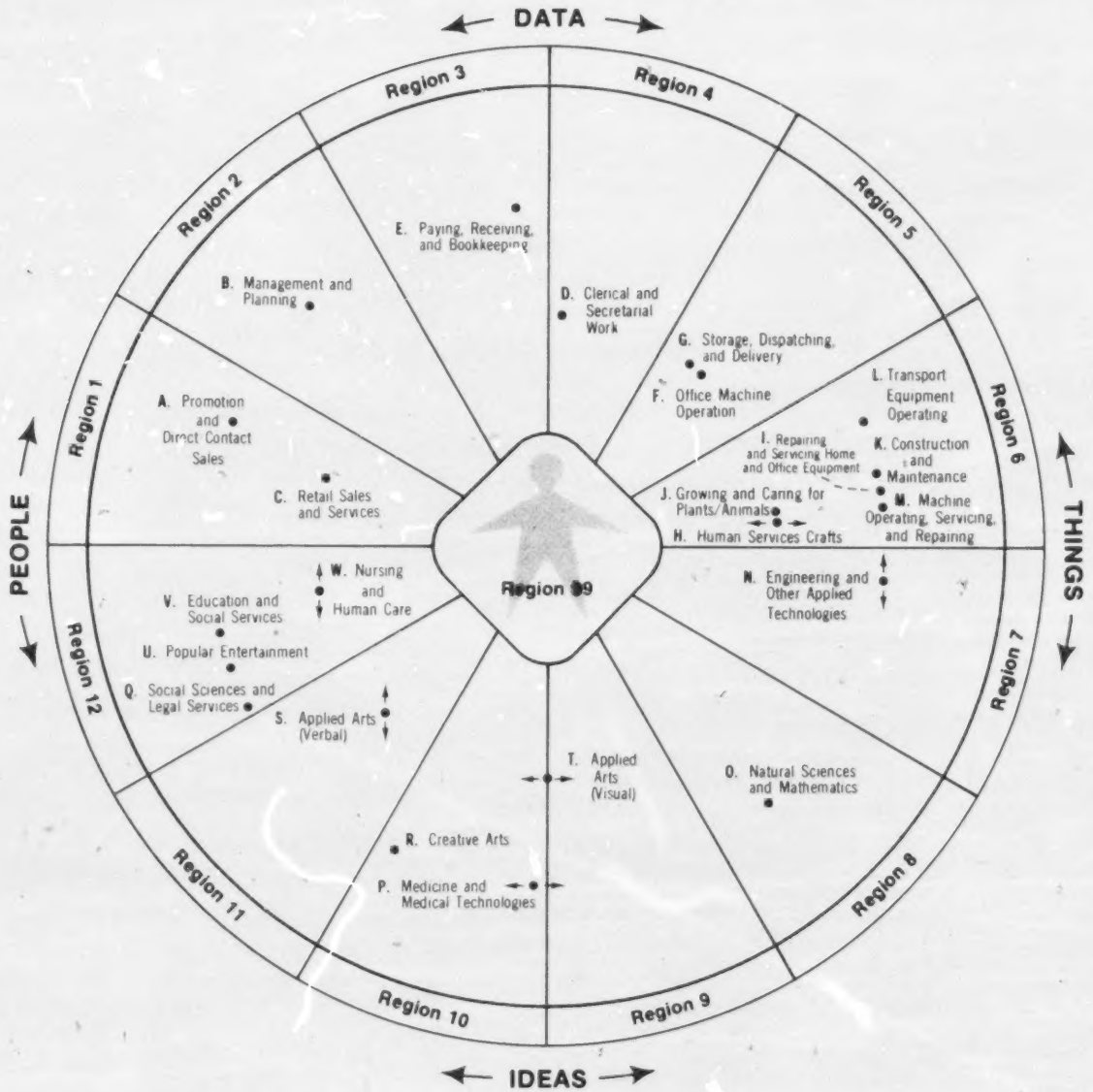


Figure 3. ACT World-of-Work Map

UNIACT Development

Development of Sex-balanced Item Pool

The nature and extent of sex differences in the responses to interest inventory items have been repeatedly documented (e.g., see Campbell, 1974; Hanson, 1974; Johansson & Harmon, 1972; Rayman, 1976). Perhaps the most notable finding is *not* that there are large sex differences but that men and women respond in a similar manner to many interest inventory items. Beginning with the work of Rayman (1976), a systematic review of the ACT-IV was made to determine which of the existing items were sex-balanced and to determine the item characteristics which may have contributed to that balance. Existing sex-balanced items in the various forms of the ACT Interest Inventory provided the nucleus for a sex-balanced item pool. New items were written and added to the pool. As described below, six different samples including over 10,000 individuals were used in determining and cross-

checking item characteristics. More than 200 potentially sex-balanced items were administered to these samples. Many of the items underwent repeated tryouts.

For purposes of a working definition during the construction of the UNIACT, an item was considered to be "sex-balanced" if the difference in the percentage of "like" responses between men and women was 10% or less. This definition is somewhat more conservative than that used by Campbell (1974) who suggested that a difference of 15% or more between two groups is a substantial and meaningful difference in the responses to an interest inventory item. The 10% difference definition of sex balance was used throughout all the item tryouts, although a few items in the final pool did not meet this criterion. A description of the samples used for the various item tryouts is provided in the next section.

Samples and Items Analyses

An overview of the samples used for the item tryout and validation studies is provided in Table 1. Hereafter, these samples will be referred to by letter designation (e.g., Sample A, B, C, etc.). For all samples except Sample B, potentially sex-balanced items were administered concurrently with the ACT-IV (or one of its alternative forms). For Sample B, the items were administered within 8 weeks after students completed the ACT-IV.

TABLE 1

Description of UNIACT Item Tryout Samples

Sample	N	Percent Women	Educational Level	Nature of Sample
A	1,825	63	Grade 14	A sample of college sophomores who responded to a follow-up survey of ACT-IV national norm group (Hanson, 1974).
B				
Item Analysis	1,191	59	Mostly	A nationally representative sample of ACT-tested college-bound students. Sample was obtained by taking every 65th student from the October 1975 national test date. Sample was randomly divided into item analysis and holdout groups.
Holdout	1,191	58	Grade 12	
C				
Item Analysis	1,123	49	Grade 9	Sample obtained from 10 rural, small city, and suburban high schools in Iowa and Missouri. Sample was randomly divided into item analysis and holdout groups.
Holdout	725	50		
D	1,250	29	Community College Adults	Students 25 years and older enrolled in degree-oriented programs in 10 community colleges in 7 states.
E				
Item Analysis	1,031	43	Grade 11	Eleven schools selected from the 200 that participated in the national norming of the Career Planning Program, Grades 8-12 (ACT, 1974). Schools were in rural, medium city, large city, and suburban locations in 11 states.
Holdout	1,031	45		
F				
Item Analysis	201	50	Grade 11	Five schools chosen in a manner similar to Sample E. Schools were in five states and rural, urban, and suburban settings.
Holdout	820	57		
Total	10,388			

There were three more or less distinct stages of scale development. The first involved Samples A and B; the second Samples C and D; the third Samples E and F. Samples B, C, E, and F were each randomly subdivided into an item analysis sample and a holdout (cross-validation) sample. Items selected on the basis of results from the item analysis samples were scored on the appropriate UNIACT preliminary scales using responses given by the holdout samples. The resulting scale means and frequency distributions were checked for overall sex balance. Scale intercorrelations were also examined. At each stage of scale development, item selection and refinement were determined by the degree of balance in the percentage of "like" responses for males and females and by the correlation of items with the various ACT-IV scales. Items which showed a 10% or less difference in the percentages of "like" responses and which correlated with the appropriate scales were retained for subsequent tryouts. For samples C, D, E, and F, potentially sex-balanced items were also correlated with data/ideas and things/people factor scores based on the theoretical definitions of the two bipolar dimensions (see Figure 2). These factor scores were obtained by multiplying the six ACT-IV scale scores by factor weights derived from factors defined *a priori* according to theoretical expectations. (See further discussion in section on validity evidence.) Items which correlated with the appropriate factor score and which were sex-balanced were retained for possible inclusion on the final scales. Data from the item analysis subsamples of Samples E and F were used in making final refinements in the UNIACT scales.

The final form of UNIACT contains 90 items; 15 items are assigned to each of the six basic interest scales paralleling the ACT-IV scales. Raw scores for a scale are obtained by summing the like, indifferent, and dislike responses (assigned weights of 3, 2, and 1, respectively) and dividing by the total number of items answered for each scale. The raw scores range from 1.0 to 3.0 for each scale. To compare an individual's level of interest across scales, the raw scores are converted to standard scores (combined-sex norms) with a mean of 50 and a standard deviation of 10, based on a representative sample of high school college-bound students. The UNIACT Data/Ideas and Things/People scales consist of 30 items each. These items are among the 90 used in the six basic interest scales. Hence, there is overlap in the item content of the two bipolar summary scales and the six basic interest scales. In the VIESA program developed for use in grades 8-12, only the 60 items scored in the bipolar scales are used.

UNIACT Item Characteristics

Unless otherwise noted, all analyses reported in this section and the sections that follow were conducted on a sample of 1,851 (914 males and 937 females) obtained by combining holdout groups from Samples E and F. Data presented in this section illustrate the outcomes of the scale construction techniques used with Samples A through F.

Item Homogeneity

Since the scales of the UNIACT were designed to measure six basic interest dimensions, it was essential for the items of a scale to have a high degree of homogeneity. The relationships between the individual items and the six UNIACT scales were summarized by correlating each item with each total score. If the items comprising each scale are homogeneous, the correlations of those items with the total score for that scale should be higher, on the average, than the correlations with the total score for any other scale. Since the correlation of an item with its own scale is probably an overestimate (because the item is part of the total score for that scale), the 90 UNIACT items also were correlated with scores from the ACT-IV scales.

The median item-total correlations between each of the six sets of UNIACT items and total scores for the six UNIACT scales and the six ACT-IV scales are presented in Table 2 for men and Table 3 for women. For all scales for both men and women, the median correlation between an item and the corresponding UNIACT scale scores is considerably higher than the median correlation between the item set and the total score of any other scale. Hence, the items for each scale appear to be more closely related to their own scale than any other

TABLE 2

Median Correlations between UNIACT Items and UNIACT and ACT-IV Total Scale Scores for Male

UNIACT Item Sets (15 Items/Set)	UNIACT and ACT-IV Scales					
	Science	Creative Arts	Social Service	Business Contact	Business Detail	Technical
Science	72(60)	23(18)	26(23)	13(10)	15(13)	13(15)
Creative Arts	21(14)	60(48)	25(22)	16(16)	10(10)	13(12)
Social Service	22(20)	23(23)	59(44)	37(35)	24(24)	11(08)
Business Contact	11(11)	17(12)	39(28)	57(47)	36(34)	18(14)
Business Detail	12(14)	07(03)	28(20)	40(35)	65(51)	25(21)
Technical	09(07)	14(15)	14(13)	19(17)	21(19)	56(35)

Note. Sample based on 914 males (holdout samples E and F) as described in text. Values shown are the median correlations (decimals omitted) between the items on each UNIACT scale and the UNIACT total scale scores (ACT-IV in parentheses). Underlined values indicate the median correlation between an item set and the corresponding total scale score.

TABLE 3

Median Correlations between UNIACT Items and UNIACT and ACT-IV Total Scale Scores for Females

UNIACT Item Sets (15 Items/Set)	UNIACT and ACT-IV Scales					
	Science	Creative Arts	Social Service	Business Contact	Business Detail	Technical
Science	68(57)	18(16)	23(15)	06(03)	04(00)	23(23)
Creative Arts	16(15)	62(47)	25(15)	19(15)	-03(-02)	23(21)
Social Service	17(20)	20(19)	51(35)	23(26)	08(07)	14(15)
Business Contact	05(05)	16(12)	28(17)	51(38)	26(21)	13(14)
Business Detail	00(03)	-04(-06)	08(07)	33(25)	66(50)	19(17)
Technical	17(18)	16(16)	13(12)	15(12)	15(11)	55(40)

Note. Sample based on 937 females (holdout samples E and F) as described in text. Values shown are the median correlations (decimals omitted) between the items on each UNIACT scale and the UNIACT total scale scores (ACT-IV in parentheses). Underlined values indicate the median correlation between an item set and the corresponding total scale score.

scale. The median item-total correlation for an item set with its own total scale score ranged from .51 to .72. The next largest correlations were in the mid-20s to mid-30s and nearly always with adjacent scales in Holland's circular structure (Holland, 1973). For example, the median item-total correlation of the Business Contact items with the Business Contact total score is .57 for men and .51 for women. The next highest correlations are with the Social Service scale (.39 men and .28 women) and the Business Detail (.36 men and .26 women). The lowest correlation is with the Science scale (.11 men and .05 women), which is directly across the circular structure of interests. This same pattern of correlations generally holds for other sets of items as well. In addition, the same general pattern was found when each set of items was correlated with the six ACT-IV raw scores. As expected, the magnitude of the correlations was somewhat lower.

Given the restricted range of a three response item scale, these item-total correlations are relatively high and suggest that the goal of constructing homogeneous sets of items with varying degrees of independence for each scale was met. Additional evidence regarding the homogeneity of the interest scales is provided by the internal estimates of reliability presented in a subsequent section.

Sex Differences in Item Responses

A major goal in constructing the scales of the UNIACT was to eliminate large sex differences in the item responses. Although there were a few exceptions, items were generally retained for a scale if the difference in the percentage of "like" responses for men and women was 10% or less.

A summary of the sex differences in the item responses is provided in Table 4. The average difference (mean of the absolute differences) between men and women ranges from 4.1 for the Business Contact scale to 12.3 for the Social Service scale. Five of the six scales have an average difference of less than 10% and four of the six scales have at least 13 of the 15 items with less than a 10% difference in the percentage of "like" responses. The Social Service scale is the least well sex-balanced scale, although the average difference (12.3) is still less than the 15% difference which Campbell (1974) suggests as a criterion for a meaningful difference. Overall, 80% of the items on the UNIACT are sex-balanced when a 10% difference is used to define balance. Of the remaining items, 61% are answered "like" more frequently by females than males. Across the total item pool, 60% of the items are answered "like" more frequently by females.

TABLE 4

Sex Differences in UNIACT and ACT-IV Item Responses

Item Characteristics	UNIACT and ACT-IV Scales					
	Science	Creative Arts	Social Service	Business Contact	Business Detail	Technical
Mean of absolute difference between males and females in the percentages of "like" responses	5.3 (13.1)	6.2 (15.7)	12.3 (25.4)	4.1 (8.7)	4.9 (11.4)	8.7 (22.9)
Number of items with a sex difference in the percentage of "like" responses of 10% or less	13 (5)	14 (6)	7 (1)	14 (11)	14 (8)	10(3)

Note. Sample based on 937 females and 914 males (holdout samples E and F) completing the six 15-item scales of the UNIACT. Values reported in the parentheses are based on the ACT-IV data provided by Hanson (1974).

As shown in Table 4, the degree of sex balance in UNIACT items is a substantial improvement over that of ACT-IV items. For example, only one item on the ACT-IV Social Service scale and three items on the ACT-IV Technical scale are sex-balanced. Across all the ACT-IV scales, only 38% of the items meet the 10% criterion for sex balance. Additional evidence regarding the degree of sex balance at the scale level is presented in a subsequent section.

Age-Sex Differences in Item Responses

The UNIACT was intended for use in a variety of settings and with individuals of a wide range of ages. Intuitively one might expect differences in the preferences of the sexes for work related activities to increase with age because of the longer exposure to sex-stereotyped attitudes prevalent in our society. Because of the differential exposure by age to such sex-stereotyped attitudes, sex balance obtained for one age group may not hold for an older or a younger age group. As part of the development of the UNIACT, a preliminary version was administered to three different age samples—ninth graders (Sample C), twelfth graders (Sample B), and adult community college students who were 25 years old or older (Sample D). The item pool for this preliminary version contained 71 items which were eventually included in the final form of the UNIACT. Items from all six of the final scales were represented although there were fewer items from the Social Service and Technical scales than from the other scales.

A summary of the item sex balance across the three different age samples is provided in Table 5. The average difference (mean of the absolute differences) between males and females in the percentage of "like" responses to these 71 items was nearly identical for the three age groups. In addition, about 60 of the 71 (84%) items showed a 10% difference or less in the percentage of "like" responses for each of the three age groups. These data suggest that the degree of sex balance in interest inventory items is relatively constant across a wide range of ages.

TABLE 5

Sex Differences in UNIACT Item Responses for Three Diverse Age Groups

Item Characteristics	Age Groups		
	Adults[a]	12th Graders[b]	9th Graders[c]
Mean of absolute difference between males and females	6.3 %	6.1%	6.2%
Number of items with a sex difference in the percentage of "like" responses of 10% or less	59	60	59

Note. Data are based on 71 items common to the item pools administered to the three age groups and included in the final form of the UNIACT.

[a]Based on 1,250 community college adults in Sample D.

[b]Based on 1,191 12th graders from holdout subgroup of Sample B.

[c]Based on 725 9th graders from holdout subgroup of Sample C.

Degree of Sex Balance

Another way to evaluate the sex differences in the UNIACT item responses is to examine the raw score scale means and standard deviations. If the new items are sex-balanced, the raw score means should be highly similar for men and women. In addition, the overlap of the male and female distributions for each scale should be high. The overlap of two distributions has been defined by Tilton (1937) as the percentage of scores obtained by one group that may be matched by scores in another group. Dunnette (1966) suggested that two distributions which overlap less than 75% are different in meaningful ways. Conversely, two distributions which overlap more than 75% are not very different and can be considered highly similar.

Table 6 presents UNIACT scale means, standard deviations, and percent overlap for males and females. As previously noted, the first six scales correspond to the six basic types of interest ("personal orientations") proposed in Holland's theory of careers (Holland, 1973). Male-female overlap for these scales ranges from 82% to 97%. The overlap for the Social Service and Technical scales, which correspond to types of interest traditionally exhibiting large sex differences (Social and Realistic), exceeds 80% for both scales. Overlap for the Data/Ideas scale was 95%, indicating excellent sex balance. Overlap for males and females on the Things/People scale (76%) is somewhat lower but

TABLE 6

UNIACT Means and Standard Deviations for Males and Females, and Percent Overlap

UNIACT Scales	Males		Females		Percent Overlap[a]		
	$\bar{X}$	SD	$\bar{X}$	SD	UNIACT	ACT-IV[b]	SDS[c]
Science	1.92	.58	1.77	.56	90	91	73
Creative Arts	1.97	.50	2.04	.52	94	78	80
Social Service	2.11	.44	2.28	.40	84	61	56
Business Contact	1.98	.45	1.94	.42	96	90	94
Business Detail	1.85	.49	1.89	.51	97	93	75
Technical	1.90	.44	1.70	.42	82	59	35
Data/Ideas	13.98	5.19	14.58	5.36	95	d	d
Things/People	14.40	4.26	11.89	3.85	76	d	d

Note. UNIACT data based on 914 males and 937 females (holdout samples E and F).

[a]Based on Dunnette's (1966) table for Tilton's measure of overlap.

[b]Overlap data for ACT-IV raw scores were obtained for the 1,031 students in the holdout group of sample E and are provided for comparative purposes only. ACT-IV scales were not designed to be sex-balanced and raw scores are *not* reported.

[c]Overlap data for SDS summary scores were obtained for 630 "urban high school students" using $\bar{X}$s and SDs provided by Holland (1972, p. 22).

[d]These scales were not included on the ACT-IV.

still substantial. Although perfect sex balance has not been achieved in the UNIACT scales, data on the overlap of ACT-IV scales and SDS scales (also presented in Table 6) indicate that sex balance has been improved substantially.

Comparisons of male-female overlap in the analysis sample with the overlap in nationally representative samples indicate that results similar to those reported above can be expected for more broadly representative groups. For example, the overlap between the scores of 11th grade males and females in the Vocational Interest Profile (VIP) national norm group (ACT, 1974) was estimated to exceed 90% for both the Data/Ideas and the Things/People scales. However, these estimates were based on equated scores since the UNIACT had not actually been administered to the VIP national norm group. UNIACT *scale* scores for the Data/Ideas and Things/People dimensions were equated to VIP *factor* scores for the same dimensions using the equipercentile equating procedure. The equating sample consisted of 643 11th grade students (slightly more females than males) enrolled in four of the high schools in the Sample F holdout group. Urban, rural, and suburban settings were represented. More than two-thirds of all students in these four schools took both interest inventories in a counter-balanced design involving immediate retesting.

On the basis of the equating study results, VIP *factor* scores for the Data/Ideas and Things/People dimensions were converted to UNIACT *scale* scores for each student in a randomly selected 10% sample of the 4,623 males and 4,684 females in the VIP national norm group. The means and standard deviations of the scale scores were then used to estimate male-female overlap. Because this equating process may have affected the estimates of overlap in some unknown manner, other types of national data related to overlap were also examined. These data are described below.

As shown in Table 6, male-female overlap on the six ACT-IV scales averaged 79%, with a range of 59% to 93% in the Sample E holdout group. In the ACT-IV national norm group (Hanson, 1974) overlap also averaged 79%; the range was 57% to 98%. Thus, results obtained for the Sample E holdout group and the national norm group are nearly identical. Comparisons of scale overlap for males and females in the Sample F holdout group and for 11th graders in the VIP national norm group (ACT, 1974) were also conducted. Average overlap was somewhat greater in the sample (79%) than in the national norm group (73%).

Considered together, these data and the data for the two bipolar scales suggest that sex differences in interests observed in the analysis sample are probably no larger and perhaps smaller than the differences to be expected for national samples. Hence, the data on UNIACT scale overlap shown in Table 6 should provide a good perspective on results to be expected for students in general.

Career Options Suggested to Males and Females

As noted previously, scores on the UNIACT Data/Ideas and Things/People scales are translated into a region on the World-of-Work Map. Students are encouraged to explore occupations in their reported regions and regions nearby. The distributions of region scores for the 10% sample of 11th graders in the VIP national norm group are presented in Table 7. These distributions, which provide a direct comparison of the career suggestions males and females receive from the UNIACT, were determined from the Data/Ideas and Things/People scale scores assigned to each student through the equating process described previously.

In general, the percentages of males and females referred to a given region are highly similar. Although there is some tendency for males to be referred more often to "things" occupations (regions 6 and 7) and females more often to "ideas" occupations (regions 9 and 10), the differences are not great.

The distributions of region indicators for males and females in the analysis sample are also presented in Table 7. The region indicators were based on the UNIACT Data/Ideas and Things/ People scale scores. Hence, the distributions provide another indication of the types of careers suggested to each sex. As would be expected from the data in Table 6, there is a tendency for males and females to be located toward the "things" and "people" sides of the map, respectively. Contrary to findings typical of sex-restrictive reporting procedures, however, a substantial number of males and females, particularly those in the national sample, are located in all regions of the map.

Reliability

Means, standard deviations, internal consistency estimates of reliability, and intercorrelations for

TABLE 7

Distributions of World-of-Work Map Regions Suggested to Males and Females in Two Samples

World-of-Work Region	11th Grade National Norm Group[a]		11th Grade Analysis Sample[b]	
	Males (N=462)	Females (N=468)	Males (N=914)	Females (N=937)
1	8.0	6.4	4.8	9.7
2	8.4	7.5	4.4	8.6
3	8.2	9.0	6.7	9.5
4	8.4	7.7	5.8	6.5
5	7.4	8.5	9.3	6.1
6	10.0	6.8	12.0	3.8
7	7.1	6.4	13.0	4.6
8	8.4	6.8	9.1	3.8
9	4.3	6.0	8.6	5.3
10	6.1	10.3	6.0	7.9
11	6.9	8.1	5.2	8.9
12	7.1	6.2	4.0	10.6
99	9.5	10.3	11.0	14.8

[a]Distributions based on a 10% random sample of the national sample of 4,623 males and 4,684 females in the VIP grade 11 national norm group (ACT, 1974).

[b]Distributions based on 914 males and 937 females from the Sample E and F holdout groups.

UNIACT-IV scales are shown in Table 8. For the six scales assessing Holland types, the coefficient alpha reliability estimates range from .85 to .92, with a median value of .87, a rather high value considering the relatively short length (15 items) of the scales. The standard errors of measurement range from 2.8 to 3.9 standard score units (SD = 10) across the six scales. Although test-retest reliabilities for the scales have not yet been determined, stability coefficients for the corresponding 15-item scales in the ACT-IV range from .80 to .89 for retesting after 8 weeks. The median is .85 (Hanson, 1974). The median 9-week stability coefficient for the corresponding 15-item scales in the VIP, also a forerunner of UNIACT, is .80; the range is .73 to .85 (ACT, 1974).

Because items comprising the two bipolar interest scales were weighted in opposite directions, coefficient alpha estimates of reliability could not be calculated easily. Instead, split-half estimates were obtained for the two 30-item scales. The split-half estimates for the Data/Ideas and Things/People scales were .75 and .82 respectively, values that suggest that the two interest constructs are measured with considerable reliability, especially since the contribution of response set variance to reliability is minimized on bipolar scales. Standard errors of measurement amount to less than 5.0 standard score units for both scales. Hence, scale reliability appears to be quite adequate for reports based on World-of-Work Map regions (in contrast to exact scores).

TABLE 8

UNIACT-IV Scale Intercorrelations, Means, Standard Deviations, and Internal Consistency Estimates of Reliability

	Science	Creative Arts	Social Service	Business Contact	Business Detail	Technical	Bipolar Scales: Data/Ideas	Bipolar Scales: Things/People	Theory-based Factors: Data/Ideas	Theory-based Factors: Things/People
Science	--	31	32	16	14	27	-60	02	-48	19
Creative Arts	31	--	42	31	06	27	-34	-19	-45	-36
Social Service	32	42	--	55	28	21	-05	-59	04	-60
Business Contact	16	31	55	--	57	30	34	-29	52	-35
Business Detail	14	06	28	57	--	33	53	06	65	17
Technical	27	27	21	30	33	--	00	49	04	49
Data/Ideas	-60	-34	-05	34	53	00	--	03	84	-02
Things/People	02	-19	-59	-29	06	49	03	--	-03	83
D/I Factor	-48	-45	04	52	65	04	84	-03	--	00
T/P Factor	19	-36	-60	-35	17	49	-02	83	00	--
$\bar{X}$	1.8	2.0	2.2	2.0	1.9	1.8	14.3	13.1	0.0	0.0
SD	.6	.5	.4	.4	.5	.4	5.3	4.2	1.0	1.0
Coefficient Alpha	.92	.89	.85	.85	.90	.85	.75[a]	.82		

Note. Sample based on 1,851 high school juniors (937 females and 914 males) in holdout samples E and F. The same correlational data are reported above and below the diagonal to facilitate examination of the pattern of scale intercorrelations. Decimals are omitted.

[a]Split-half reliabilities.

Validity Evidence

This section summarizes evidence that the UNIACT measures the theoretical dimensions it was designed to measure. Scale intercorrelations, factor structure, correlations with other interest inventories, and criterion-related validity data are presented.

Intercorrelations of Scales Assessing Basic Interests

The intercorrelations of the eight UNIACT scales are shown in Table 8. The results indicate good correspondence with theoretical expectations. According to Holland's theory, interest scales adjacent to each other on the hexagonal or circular structure of interests should be more highly correlated than nonadjacent scales (see Figure 1). Scales located diagonally across the interest structure should correlate the lowest. With very few exceptions, the pattern of correlations among the six Holland-type scales follows the theoretical expectations. For example, the Business Contact scale correlates most highly with the Business Detail (.57) and Social Service (.55) scales, which are adjacent scales. The Business Contact scale correlates lowest with the Science scale (.16), which is located diagonally across the circular interest structure. Correlations with the Creative Arts scale (.31) and the Technical scale (.30) fall between these values, as expected.

The intercorrelations of the six UNIACT scales assessing Holland's basic types of interests are shown for males and females separately in Table 9. For both males and females, the obtained correla-

TABLE 9

UNIACT Scale Intercorrelations for Males (below Diagonal) and Females (above Diagonal)

	UNIACT Scales					
UNIACT Scales	Science	Creative Arts	Social Service	Business Contact	Business Detail	Technical
Science	---	30	35	12	06	32
Creative Arts	34	---	39	32	- 04	35
Social Service	37	43	---	49	14	27
Business Contact	20	30	64	---	50	29
Business Detail	23	15	41	63	---	31
Technical	18	25	25	31	39	---
Males						
Mean	1.9	2.0	2.1	2.0	1.8	1.9
S.D.	.6	.5	.4	.4	.5	.4
Females						
Mean	1.8	2.0	2.3	1.9	1.9	1.7
S.D.	.6	.5	.4	.4	.5	.4

Note. Correlations reported below the diagonal are based on 914 males and correlations above the diagonal are based on 937 females (holdout samples E and F).

tions generally correspond to theoretical expectations. The pattern of correlations of each scale with the other five scales is similar for men and women, thus indicating that the structure of interests is similar for the two sexes. Additional information regarding the structure of interests, as measured by the UNIACT, is provided in the following sections.

Interest Structure Underlying UNIACT Scales

As shown by Figure 1, the theoretical model underlying the UNIACT requires that the Data/Ideas scale should have high positive correlations with the Business Detail and Business Contact scales and high negative correlations with the Science and Creative Arts scales. The Things/People scale should have a high positive correlation with the Technical scale and a high negative correlation with the Social Service scale. The correlations shown in Table 8 exhibit the expected pattern. In addition, the Data/Ideas and Things/People scales are uncorrelated (r = .03), as expected. Finally, the two bipolar scales correlate highly (.84 and .83) with two theory-based factors defining the bipolar dimensions. These theory-based factors were extracted from the intercorrelations matrix for the six UNIACT scales by using theoretical expectations to define, *a priori*, the desired factor loadings. As can be seen in Table 8, correlations of the six basic interest scales with the two theory-based factors are similar to the correlations of the six scales with the two bipolar scales, thus providing further evidence that the bipolar scales are assessing the intended dimensions.

As noted above, the theory-based factors defining the bipolar dimensions were extracted on the basis of *a priori* definitions. Hence, one might ask how well these factors correspond to the "real" dimensions underlying the data. Unfortunately, an infinite number of real dimensions are possible. Principal components analysis, factor analysis, and various rotation procedures all produce arbitrary factors determined in part by the data and in part by arbitrary criteria built into the procedures. Thus, there are no "real" dimensions with which to compare the theory-based factors. However, if the factors are useful summaries of the interest dimensions assessed by the UNIACT basic interest scales, then one would expect them to account for about as much variance as the two primary principal components and have similar patterns of factor loadings.

The results of principal components analysis of the six-scale intercorrelation matrix are reported in Table 10 along with data for the two theory-based

TABLE 10

Comparison of UNIACT Factor Structure with Factor Structure of the ACT-IV and VIP

	UNIACT Principal Components Loadings		Loadings on Theory-based Factors					
			UNIACT		ACT-IV		VIP	
Scale	1 (D/I)	2 (T/P)	1 (D/I)	2 (T/P)	1 (D/I)	2 (T/P)	1 (D/I)	2 (T/P)
Science	-51	33	-48	19	-49	17	-45	21
Creative Arts	-55	-18	-45	-36	-47	-35	-43	-40
Social Service	-14	-44	04	-60	05	-61	05	-58
Business Contact	36	-27	52	-35	51	-39	52	-33
Business Detail	63	14	65	17	63	21	66	14
Technical	03	66	04	49	01	49	08	49
Percent of variance accounted for [a]	32	26	32	26	31	27	31	26

Note. Decimals are omitted from factor loadings. Data are based on the following samples: UNIACT—Samples E and F holdout groups; ACT-IV—Sample E holdout group; VIP—Sample F holdout group.

[a]Percent variance accounted for by Data/Ideas (D/I) and Things/People (T/P) factors after variance associated with the general response set factor is removed.

factors. The two factors were extracted through use of a computer program provided by Cooley and Lohnes (1971). As shown in the table, the two principal components and the two theory-based factors account for identical proportions of variance (a total of 58%). In addition, the factor loadings are similar for the two types of analyses. The theory-based factors extracted from the UNIACT, ACT-IV, and VIP are nearly identical.

The UNIACT factor loadings are plotted in Figures 4, 5, and 6. The correspondence between the scale locations and the theoretical model shown in Figure 1 is readily evident. The hexagonal configuration proposed by Holland is reproduced with nearly equal distance between scales and the scales are arranged in the expected order.

Considered as a whole, these results provide impressive evidence of the explanatory power of the two theory-based factors. Other factors are present in the data, of course, and their nature is being investigated. However, the Data/Ideas and Things/People factors appear to provide a sensible and useful summary of the basic structure of human interests. As previously noted, additional research supporting the two factors has been summarized by Hanson (1974) and Prediger (1976a).

Not shown in Table 10 is a general factor common to interest inventories using response categories such as "like," "indifferent," and "dislike." When such categories are used, the frequency with which a particular response is chosen tends to vary from person to person, regardless of item content. That is, some persons tend to choose "like" more often than others, some choose "indifferent" more often, etc. Hence, there is a general response-related factor affecting the scores on each scale. The chief identifying feature of this factor, to be called the "response level factor," is that *all* interest scales have relatively high loadings on it. Often these loadings range in the 60s and 70s. Unfortunately, the presence of a response level factor is not usually evident in factor analyses of inventories using categorical responses because the original factors are rotated to simple structure or some other arbitrary criteria using a procedure like varimax. Forced-choice interest inventories, such as the Kuder General Interest Survey, do not produce a response level factor.

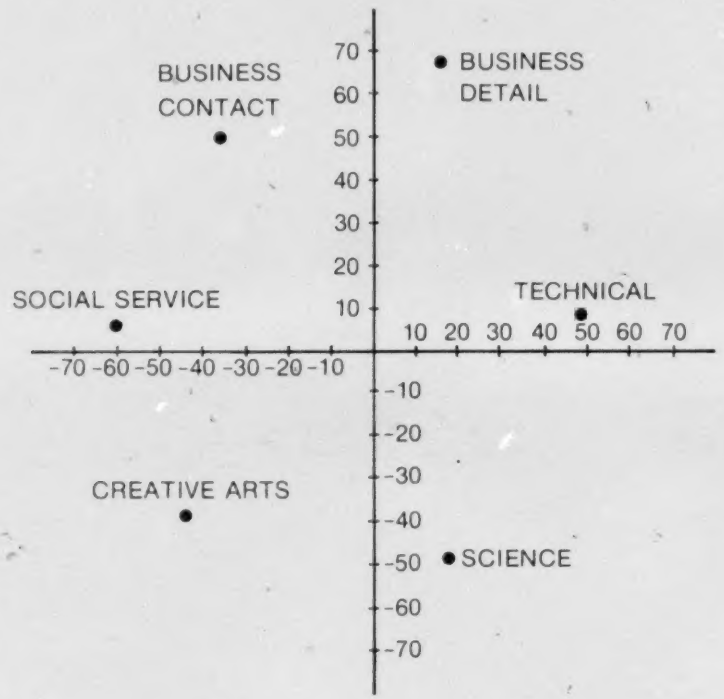


Figure 4. Plot of UNIACT theory-based factor loadings for males (N=914) and females (N=937) combined

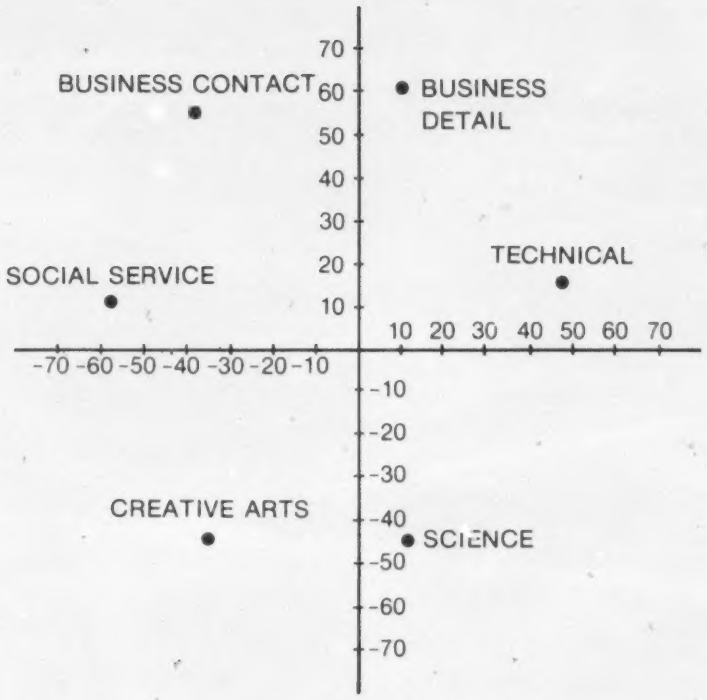


Figure 5. Plot of UNIACT theory-based factor loadings for males (N=914)

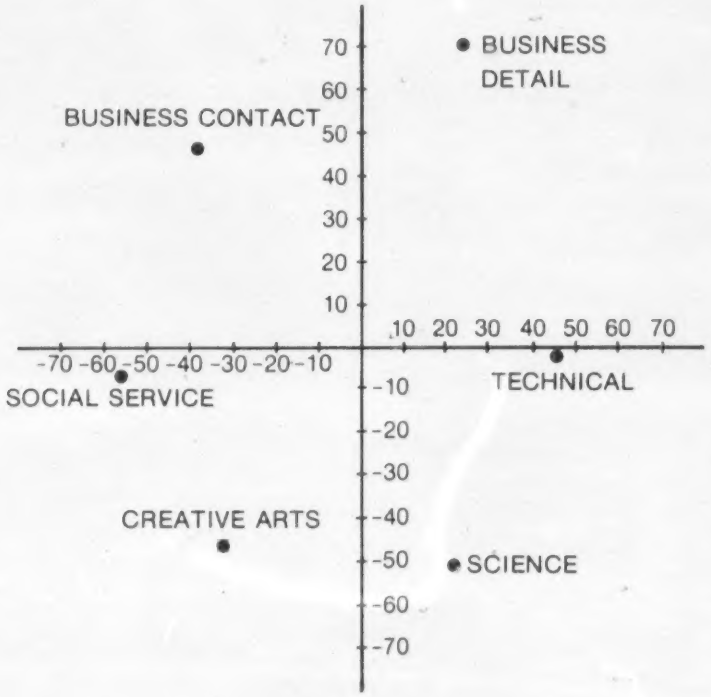


Figure 6. Plot of UNIACT theory-based factor loadings for females (N=937)

Several unpublished studies conducted at ACT have examined the strength of the response level factor in inventories reporting results for homogeneous scales. For example, principal components analyses of intercorrelation data provided by Holland (1975) for the Vocational Preference Inventory (VPI) reveal response level factors accounting for 56% and 53% of total VPI variance for high school girls and boys, respectively. Scale correlations with the response level factor ranged from .61 to .88. Similar analyses of VPI data for large samples of college students (ACT, 1969) indicate response level factors accounting for .45 and .44 of the total variance. When Ohio Vocational Interest Survey (OVIS) intercorrelation data for 8th through 12th graders in the OVIS national norm group (D'Costa, Winefordner, Odgers, & Koons, 1970) were subjected to principal components analysis, response level factors accounting for 49% and 42% of total OVIS variance were found for males and females, respectively. For males, the median correlation of the 24 OVIS scales with the response level factor was .71; the range was .50 to .85. In each of the above analyses, the response level factor was the first to emerge, thus indicating that it was more powerful than the bipolar factors that subsequently emerged.

The above analyses and analyses of other interest inventories show that the response level factor typically accounts for 35% to 60% of the total variance in interest inventories not using a forced choice mode of response. The response level factors obtained as a by-product of the analyses reported in Table 10 account for about 41% of the total variance for each of the three interest inventories. (The range was 40% to 42%.) UNIACT scale loadings on this factor ranged from .59 to .68 with a median of about .64. Thus, results for UNIACT are typical of those found for other inventories. In Table 10, the percent of variance accounted for by the theory-based factors was determined after variance associated with the response level factor was removed.

Relationship with ACT-IV and VIP Scales

The extent to which the UNIACT, ACT-IV, and VIP assess the same basic interest factors was described in a previous section. This section examines the correlations between corresponding scales.

Items on the UNIACT involve activities associated with the same six basic types of interest assessed by the ACT-IV and the VIP. However, the UNIACT items are endorsed in similar proportions by males and females. Such items should be much less subject to stereotypic reactions to the object or nature of an activity than many of the items on other interest inventories (e.g., take dictation, repair a hot rod, operate a power shovel). To the degree that sex role expectations affect the scores on interest inventories, irrelevant variance is introduced, unless of course one's purpose is to assess stereotypic attitudes toward various types of activities, occupational titles, etc. Even though the UNIACT and ACT-IV were designed to measure the same interest dimensions, one would expect only moderate correlations between corresponding scales because the other instruments are not based on sex-balanced items.

Concurrent correlations between the six pairs of same-named scales on the UNIACT and the ACT-IV, shown in Table 11, range from .76 to .86 for the holdout subgroup of Sample E; the median correlation is .80. Correlations for same-named scales on the UNIACT and VIP, based on the holdout subgroup of Sample F, range from .72 to .81 with a median value of .74. These correlations represent a relatively high degree of relationship given the reliability levels of these relatively short scales and differences in the sex balance of item content.

The correlations reported in Table 11 are substantially higher than those reported for the VPI and Self-Directed Search (SDS), instruments developed by Holland to assess his six types (Holland, 1973). In several recent studies (Fishburne & Walsh, 1976; Gaffey & Walsh, 1974; Horton & Walsh, 1976) correlations between the same-named scales ranged from .25 to .78 with a median of about .55 for various samples of employed adults. Holland (1972) reports VPI-SDS correlations for same-named scales ranging from .20 to .54 (median = .43) for 347 college women and from .50 to .65 (median = .55) for 344 college men. The UNIACT correlations reported in Table 11 are quite high in comparison, especially since the VPI is a major component of the SDS.

Summary of Criterion-related Validity Evidence

In view of the data reported in the previous sections, criterion-related validity evidence for the various forms of the ACT-IV can be readily generalized to the UNIACT. All forms were designed to assess the same basic dimensions of interests; all report sex-balanced scores; correlations between

TABLE 11

Correlations of UNIACT-IV Scales with ACT-IV and VIP Scales

	UNIACT-IV Scales							
ACT-IV Scales[a]	Science	Creative Arts	Social Service	Business Contact	Business Detail	Technical	$\bar{X}$	S.D.
Science	86	28	33	13	15	23	2.5	1.0
Creative Arts	28	82	49	23	00	17	2.7	.9
Social Service	20	36	78	38	18	11	3.2	.9
Business Contact	08	30	57	78	46	23	2.7	.8
Business Detail	12	09	30	50	84	24	2.4	.9
Technical	35	23	12	24	30	76	2.7	.9
Mean	1.9	2.0	2.2	2.0	1.8	1.8		
S.D.	.6	.5	.4	.4	.5	.4		
VIP Scales[b]							$\bar{X}$	S.D.
Science	81	18	32	20	20	29	2.5	1.0
Creative arts	19	72	34	18	03	20	3.0	.9
Social service	20	23	72	32	26	14	3.1	.9
Business contact	12	21	48	74	51	27	2.5	.7
Business detail	00	05	23	49	74	21	2.6	.9
Technical	23	10	09	22	25	74	2.6	.9
Mean	1.8	2.0	2.2	2.0	1.9	1.8		
S.D.	.6	.5	.4	.4	.5	.4		

[a]Correlations based on holdout subgroup of Sample E (N=1,031).

[b]Correlations based on holdout subgroup of Sample F (N=820).

corresponding scales are substantial; and the interest structure underlying the various instruments is nearly identical. The following publications report criterion-related validity studies relevant to the UNIACT: ACT (1974, 1976, 1977), Barnhardt (1976), Grandy (1976), Hanson (1974), Hanson (in press), Hanson and Rayman (1976), Lamb (1975), Prediger and Hanson (in press), and Schussel (1975). Procedures used in these studies to determine criterion-related validity include discriminant analysis with centroid plots and centour score hit rates, hit rates for high-point codes, projections of college major centroids and occupational preference group centroids onto the data/ideas and things/people dimensions, mean profiles for various criterion groups, and correlations of interest scores with work-related experiences and out-of-class accomplishments. Several of the studies were briefly described in the previous section reviewing research on procedures for reporting interest scores.

The results of the above studies are summarized in this section in the form of high-point codes for various criterion groups. Although long a popular summary procedure, high-point codes conceal the extent to which the interest scores of a criterion group differ from scale to scale and the degree to which the interests of various criterion groups differ. Hence, readers are referred to the original studies for more specific and useful information on UNIACT validity.

Two longitudinal studies of criterion-related validity are currently in progress and should also provide valuable information. The first study involves a 3-year follow-up of a nationally representative sample of 9,300 11th graders who took the VIP early in 1973 (ACT, 1974). Results of the follow-up are currently being analyzed. The second study involves a 4-year follow-up of 12,169 college seniors from a nationwide sample of 32 institutions (Hanson, 1974). These students took the ACT-IV in the spring of 1973; follow-up data are currently being collected. Readers interested in preprints of the reports for these studies should contact the senior author.

Table 12 provides summary data on the vocational interests of 103 educational criterion groups (N = 18,435) and 10 occupational criterion groups (N = 1,073). Data for 39 vocational choice groups (N = 7,148) are presented in Table 13. Although expressed choice provides, at best, an intermediate and possibly contaminated criterion for validating vocational interest inventories, the use of such a criterion is widely accepted in vocational psychology, as illustrated by the work of Holland and his colleagues. In addition, research has shown that vocational choices are moderately stable during the later years of high school (e.g., see Whitney, 1969) thus indicating that many students have established a general direction for their careers during that stage of development. Minor changes in occupational choices are accommodated by the broad job family groupings used in Table 13. For these reasons, the data in Table 13 should provide a useful supplement to the educational and occupational criterion group data summarized in Table 12.

For all criterion groups, 3-letter codes are reported in terms of Holland's (1973) typology (see footnote to Table 12). The codes simply indicate the rank order of the means for the three highest interest scales. Sex-balanced scores were used in calculating the means for all criterion groups.

Criterion group data are organized according to the occupational clusters used in the ACT Occupational Classification System (Hanson, 1974; Prediger, 1976a) mentioned previously. The clusters resemble Holland's six clusters but use type of work and work setting rather than psychological traits as the primary basis for classification. Thus, similar occupations with dissimilar high-point codes are not scattered across clusters as in Holland's (1972) system (e.g., see Holland's codes for psychologist and sociologist; for industrial, mechanical, and chemical engineers). Instead, occupations closely related in terms of field of work are grouped together, thus making it easier for the user of the classification system to obtain an overview of the world of work. This type of grouping is followed in Table 12. In Table 13, specific occupational choices have been grouped into one of the 25 job families used in the classification system. The job family titles provide good perspective on the occupational content of the six clusters.

In both tables, criterion group data are reported separately by sex whenever the data are available separately. This is important because some reporting procedures produce substantially different interest profiles for males and females pursuing the same occupation (Campbell, 1974; Prediger & Hanson, 1976). Typically, the differences conform to sex-role stereotypes. Common sense suggests, however, that if interests represent basic and useful constructs of human behavior, persons pursuing the same occupation should have similar interests. As proposed by Prediger and Hanson (1976) and confirmed by Holland (1976), this observation is implicit in Holland's theory of careers (Holland, 1973). The data in Tables 12 and 13 provide no

TABLE 12

A Summary of ACT Interest Inventory Scores Obtained by Various Educational and Occupational Criterion Groups

Criterion Group	Sex	N[a]	Data Source[b]	Type of Study[c]	Three-letter Holland Code[d]
Business Sales and Management					
Marketing	M	303	A	C-4	ECR
	F	90	A	C-4	ECA
	M-F	63	E	C-4	ECA
Business and Marketing	M	94	D	L-E	ECS
	F	37	D	L-E	$\overline{E}AS$
Business, general	M	543	A	C-4	ECR
	F	175	A	C-4	CER
Business and Commerce	F	136	C	L-4	CES
	M	135	C	L-4	CES
Business Administration (transfer)	M	78	B	C-2	$\overline{CE}S$
	F	37	B	C-2	CER
Business Operations					
Accounting	M	385	A	C-4	CER
	F	140	A	C-4	CER
	M-F	89	E	C-4	CER
	M	66	B	C-2	CES
	F	74	B	C-2	CER
	M	47	D	L-E	CE$\overline{A}$I
	F	80	D	L-E	CER$\overline{I}$
Secretarial Science	F	402	B	C-2	CES
Data Processing	M	94	B	C-2	CIE
Technologies and Trades					
Computer Programming	M	83	B	C-2	CEI
	F	59	B	C-2	CEI
Cosmetology	F	34	B	C-2	RA$\overline{I}\overline{E}$
Drafting	M	172	B	C-2	AIR
Auto Mechanics	M	297	B	C-2	RCS
Miscellaneous Trades	M	405	B	C-2	REI
Machine Work	M	73	B	C-2	RI$\overline{S}$A
Agriculture	M	120	B	C-2	REC
	M	334	A	C-4	RIC
Electrical Engineering Technology	M	369	B	C-2	IRA
	M	284	D	L-E	RIC
Other Engineering Technologies	M	158	B	C-2	IRE
Engineering	M	468	A	C-4	RIC
	M	67	C	L-4	RIC
	M-F	64	E	C-4	RIC

(continued)

TABLE 12—*Continued*

Criterion Group	Sex	N[a]	Data Source[b]	Type of Study[c]	Three-letter Holland Code[d]
Natural, Social, and Medical Sciences					
Natural Sciences					
Mathematics	M	272	A	C-4	ICR
	F	217	A	C-4	ICR
	M-F	41	E	C-4	CIR
Physical Science	M	454	A	C-4	IRC
	F	102	A	C-4	IRA
	M-F	35	E	C-4	IRA
Science (transfer)	M	88	B	C-2	IRA
Science (miscellaneous)	M	131	D	L-E	IAS
Biological Sciences	M	588	A	C-4	IRS
	F	424	A	C-4	IRA
	M-F	86	E	C-4	IRA
	M	33	C	L-4	IAS
	F	34	C	L-4	IRA
Medical Sciences					
Pharmacy	M-F	65	E	C-4	ICR$\overline{E}$
Dentistry	M-F	63	E	C-4	RIC
Medicine	M-F	156	E	C-4	IS$\overline{R}$
Health Sciences/Services, general	M	272	A	C-4	SIR
	F	437	A	C-4	ISR
	F	58	C	L-4	IRA
Medical Assisting Technologies	F	224	B	C-2	ISR
Medical Technology	M-F	37	E	C-4	IRC
Social Sciences					
Psychology	M	317	A	C-4	ISA
	F	348	A	C-4	SIA
	M-F	102	E	C-4	S$\overline{I}$A
Sociology	M	292	A	C-4	SEA
	F	319	A	C-4	SEA
	M-F	60	E	C-4	SEA
Social Science, general	M	286	A	C-4	SER
	F	258	A	C-4	SAE
	M-F	55	E	C-4	SER
	M	43	C	L-4	ASE
	F	77	C	L-4	ERA
Social Science (transfer)	M	47	B	C-2	SAE
	F	84	B	C-2	SAE
Social Science (miscellaneous)	M	45	D	L-E	SA$\overline{E}$
	F	260	D	L-E	$\overline{I}$SA

(continued)

TABLE 12—*Continued*

Criterion Group	Sex	N[a]	Data Source[b]	Type of Study[c]	Three-letter Holland Code[d]
History	M	260	A	C-4	SAE
	F	185	A	C-4	SAE
	M-F	46	E	C-4	ASEC
Political Science	M	301	A	C-4	EAS
	F	83	A	C-4	EAR
	M-F	62	E	C-4	ECA
Pre-Law	M-F	115	E	C-4	CEA
Economics	M	214	A	C-4	CEI
Creative and Applied Arts					
Art	M	350	A	C-4	ARE
	F	269	A	C-4	ARE
	M-F	35	E	C-4	ARI
Commercial and Graphic Arts	F	27	B	C-2	ARE
	F	29	D	L-E	RAI
English Literature	M	188	A	C-4	ASI
	F	407	A	C-4	ASE
Speech and Dramatic Arts	M-F	32	E	C-4	AER
Foreign Languages	M	140	A	C-4	ASR
	F	266	A	C-4	ASI
	M-F	32	E	C-4	AECR
Humanities and Letters	M	25	C	L-4	ASI
Arts and Humanities (transfer)	M	43	B	C-2	SAE
	F	56	B	C-2	ARS
Arts and Humanities (miscellaneous)	M	48	D	L-E	ASI
Social, Health, and Personal Services					
Education, art	F	122	A	C-4	ARS
Education, music	M	195	A	C-4	ASR
	F	225	A	C-4	ASR
Philosophy and Religion	M	149	A	C-4	ASI
Education, elementary	M	258	A	C-4	SRA
	F	878	A	C-4	SRA
	M-F	121	E	C-4	SEC
Education, general	M	35	C	L-4	SEC
	F	214	C	L-4	SAC
Education, physical	M-F	29	E	C-4	SECR
Education, business	M	113	A	C-4	CER
	F	238	A	C-4	CES
Home Economics (miscellaneous)	F	304	A	C-4	ESR
Police Science	M	62	B	C-2	SEA
Nursing, registered	F	260	B	C-2	ISA
	M-F	182	E	C-4	SIA

(continued)

TABLE 12—*Continued*

Criterion Group	Sex	N[a]	Data Source[b]	Type of Study[c]	Three-letter Holland Code[d]
Nursing, licensed	F	255	B	C-2	ISA
Dental Assisting	F	116	B	C-2	ASR

[a]When criterion group sample sizes for a given type of study are less than 30, data for the largest available sample are shown.

[b]Data sources are as follows. Study A: A concurrent validity study of 4-year college seniors in 24 majors (Hanson, 1974); Study B: A concurrent validity study of 2-year college freshmen in 22 majors or programs (ACT, 1977); Study C: A 3-year longitudinal study of college students tested as high school seniors (Hanson, et al., in press); Study D: A 5-year longitudinal study of 2-year college entrants (Hanson et al., 1977); Study E: A concurrent validity study of 4-year college seniors in 32 majors (Grandy, 1975).

[c]C = concurrent; L = Longitudinal; 2 = 2-year college students; 4 = 4-year college students; E = employed persons.

[d]Holland types (and UNIACT scales) corresponding to abbreviations are as follows. S: Social (Social Service); E: Enterprising (Business Contact); C: Conventional (Business Detail); R: Realistic (Technical); I: Investigative (Science); A: Artistic (Creative Arts). Ties in scale order are shown by a dash over the tied scales. In general, a tie is indicated if the difference between two scale means was less than .005 standard deviation units.

TABLE 13

A Summary of ACT Interest Inventory Scores Obtained by Occupational Choice Groups

Job Families	Sex	N[a]	Three-letter Holland code[b]
Business Sales & Management Cluster			
Promotion and Direct Contact Sales	M	72	EAC
	F	56	EAR
Management and Planning	M	158	ECS
	F	48	CEA
Retail Sales and Services	M	35	ECS
	F	50	CERS
Business Operations Cluster			
Clerical and Secretarial Work	F	632	CER
Paying, Receiving, and Bookkeeping	M	97	CES
	F	124	CER
Office Machine Operation	M	161	ESC
	F	110	ECI
Storage, Dispatching, and Delivery	M	22	ECR
Technologies & Trades Cluster			
Human Services Crafts	F	93	ERA
Repairing and Servicing Home and Office Equipment	M	128	RESC

(continued)

TABLE 13—*Continued*

Job Families	Sex	N[a]	Three-letter Holland code[b]
Growing and Caring for Plants/Animals	M	221	RIS
	F	48	RAI
Construction and Maintenance	M	325	RAE
Transport Equipment Operation	M	57	RCE$\overline{A}$
Machine Operating, Servicing, and Repairing	M	360	RCE
Engineering and Other Applied Technologies	M	425	IRC
	F	44	RIC
Natural, Social, & Medical Sciences Cluster			
Natural Sciences and Mathematics	M	214	ISA
	F	80	IRA
Medicine and Medical Technologies	M	356	ISA
	F	367	ISR
Social Sciences and Legal Services	M	44	SAI
	F	106	IAS
Creative & Applied Arts Cluster			
Creative Arts	M	110	ASI
	F	159	ARI
Applied Arts (Verbal)	M	54	$\overline{A}$S$\overline{E}$
	F	55	AE$\overline{I}\overline{R}$
Applied Arts (Visual)	M	167	ASR
	F	199	ARE
Popular Entertainment	M	22	AES
Social, Health, & Personal Services Cluster			
Education and Social Services	M	222	SAE
	F	717	SEA
Nursing and Human Care	F	596	SI$\overline{E}\overline{R}$
Personal and Household Services	F	220	EAS
Law Enforcement and Protective Services	M	194	SER

Note. Data are based on a nationwide sample of 11th graders as described in text. Occupational preferences were grouped into job families spanning the entire world of work (Hanson, 1974; Prediger, 1976a).

[a]When sample sizes for a given job family are less than 30, data for the largest available sample are shown.

[b]See Table 12 for explanation of abbreviations. Ties in scale order are shown by a dash over the tied scales. In general, a tie is indicated if the difference between two scale means was less than .005 standard deviation units.

evidence of systematic, stereotypic differences in the 3-letter codes of males and females pursuing similar occupations and educational majors. Hence, these data support the construct validity of the sex-balanced scales used in the UNIACT.

A detailed analysis of the 3-letter codes obtained by the 152 criterion groups is left to the reader. In general, the codes make good sense, especially when considered in the context of sample sizes and the heterogeneous nature of many of the criterion groups. The codes for similar criterion groups generally involve the same combination of scales from study to study and for males and females. Differences in the scale sequence within a 3-letter code are often due to relatively minor variations in scale means. Codes based on concurrent data are highly similar, in most cases, to those based on longitudinal data. Considered together, the data summarized here and the data in the original studies cited above provide impressive evidence of the criterion-related validity of UNIACT scales.

Concluding Remarks

This study was prompted by a concern that many vocational interest inventories provide highly divergent and stereotypic career suggestions to men and women. Both the assumption that men and women are suited for different careers and the assumption that sex differences in interest scores are a necessary concomitant of validity were questioned. Encouraged by the fact that about one-half of the items on most interest inventories elicit similar responses from men and women, the authors sought to develop a valid vocational interest inventory from an item pool containing *only* sex-balanced items.

The data presented in this report indicate that the six Unisex ACT Interest Inventory scales assessing basic types of interests and the two scales assessing the data/ideas and things/people bipolar dimensions are psychometrically sound and tap the intended theoretical constructs. The scales have adequate reliability; they are interrelated according to theoretical expectations; they correlate highly with other instruments measuring the same constructs; and they provide similar career suggestions to males and females.

Perfect sex balance has not been achieved with UNIACT scales. Indeed, there is no evidence that the vocational interests of males and females are exactly alike. The validity data reviewed in this report do suggest, however, that similar interest patterns come closer to reality than the highly divergent interest patterns produced by many interest scales. In this respect, the UNIACT would appear to provide a more sex-fair procedure for assessing basic interests in general and Holland types in particular.

Additional research comparing the validity of interest scores obtained by various scaling and reporting procedures may eventually help us determine the true nature and distribution of human interests. In the meantime, counselors should at least be aware of the types of career suggestions provided by the interest inventories they use. The data accumulated so far indicate that career suggestions need not be sex restrictive. The sex differences found in interest inventory items and scores may simply be an unfortunate legacy from an era of measurement that took traditional sex roles for granted.

REFERENCES

The American College Testing Program. *The ACT Guidance Profile: Two-year college edition.* Iowa City, Iowa: Author, 1969.

The American College Testing Program. *Career Planning Program, Grades 8-11, handbook.* Boston: Houghton Mifflin, 1974.

The American College Testing Program. *Handbook for the ACT Career Planning Program* (1977 ed.). Iowa City, Iowa: Author, 1977.

The American College Testing Program. *Vocational Interest, Experience, and Skill Assessment: User's handbook.* Boston: Houghton Mifflin, 1976.

Barnhart, P. *Discrepancy of aspiration, personality factors, interests, and descriptive variables of students in a community college.* Unpublished doctoral dissertation, University of Illinois at Urbana-Champaign, 1976.

Berdie, R. F. Vocational choice studies. *Personnel and Guidance Journal,* 1970, *48,* 604-605.

Campbell, D. P. *Manual for the Strong-Campbell Interest Inventory.* Stanford, Calif.: Stanford University Press, 1974.

Cole, N. S., & Hanson, G. R. Impact of interest inventories on career choice. In E. E. Diamond (Ed.), *Issues of sex bias and sex fairness in career interest measurement* (National Institute of Education Report). Washington, D.C.: U.S. Government Printing Office, 1975.

Cooley, W. W., & Lohnes, P. R. *Multivariate data analysis.* New York: John Wiley & Sons, 1971.

D'Costa, A. G., Winefordner, D. W., Odgers, J. G., & Koons, P. B. *Ohio Vocational Interest Survey, manual for interpreting.* New York: Harcourt Brace Jovanovich, 1970.

Diamond, E. E. (Ed.). *Issues of sex bias and sex fairness in career interest measurement.* (National Institute of Education Report). Washington, D.C.: U.S. Government Printing Office, 1975.

Dunnette, M. D. *Personnel selection and placement.* Belmont, Calif.: Wadsworth, 1966.

Fishburne, F. J., & Walsh, W. B. Concurrent validity of Holland's theory for non-college-degreed workers. *Journal of Vocational Behavior,* 1976, *8,* 77-84.

Gaffey, R. L., & Walsh, W. B. Concurrent validity and Holland's theory. *Journal of Vocational Behavior,* 1974, *5,* 41-51.

Gottfredson, G. D. A note on sexist wording in interest measurement. *Measurement and Evaluation in Guidance,* 1976, *8,* 221-223.

Gottfredson, G. D., & Holland, J. L. Vocational choices of men and women: A comparison of predictors from the Self-Directed Search. *Journal of Counseling Psychology,* 1975, *22,* 28-34.

Gottfredson, G. D., Holland, J. L., & Gottfredson, L. S. The relation of vocational aspirations and assessments to employment reality. *Journal of Vocational Behavior,* 1975, *7,* 135-148.

Grandy, T. G. Cross-validation of the American College Testing Interest Inventory for University of Iowa students (Doctoral dissertation, University of Iowa, 1975). *Dissertation Abstracts International,* 1976, *36,* 2098-A. (University Microfile No. 75-23,039)

Hanson, G. R. *Assessing the interests of college youth: Summary of research and applications* (ACT Research Report No. 67). Iowa City, Iowa: The American College Testing Program, 1974.

Hanson, G. R., Noeth, R. J., & Prediger, D. J. The validity of diverse procedures for reporting interest scores: An analysis of longitudinal data. *Journal of Counseling Psychology,* in press.

Hanson, G. R., & Rayman, J. Validity of sex-balanced interest inventory scales. *Journal of Vocational Behavior,* 1976, *9,* 279-291.

Harmon, L. W. Technical aspects: Problems of scale development, norms, item differences by sex, and the rate of change in occupational group characteristics. In E. E. Diamond (Ed.), *Issues of sex bias and sex fairness in career interest measurement* (National Institute of Education Report). Washington, D.C.: U.S. Government Printing Office, 1975.

Holland, J. L. *Professional manual for the Self-Directed Search.* Palo Alto, Calif.: Consulting Psychologists Press, 1972.

Holland, J. L. *Making vocational choices. A theory of careers.* Englewood Cliffs, N.J.: Prentice-Hall, 1973.

Holland, J. L. *Manual for the Vocational Preference Inventory* (1975 ed.). Palo Alto, Calif.: Consulting Psychologists Press, 1975.

Holland, J. L. The virtues of the SDS and its associated typology: A response to Prediger and Hanson. *Journal of Vocational Behavior,* 1976, *8,* 349-358.

Holland, J. L., & Gottfredson, G. D. Sex differences, item revisions, validity, and Self-Directed Search. *Measurement and Evaluation in Guidance,* 1976, *8,* 224-228.

Horton, J. A., & Walsh, W. B. Concurrent validity of Holland's theory for college-degreed working women. *Journal of Vocational Behavior,* 1976, *9,* 201-208.

Huth, C. M. Measuring women's interests: How useful? *Personnel and Guidance Journal,* 1973, *51,* 539-545.

Johansson, C. B. *Manual for the Career Assessment Inventory.* Minneapolis: National Computer Systems, 1976.

Johansson, C. B., & Harmon, L. W. The Strong Vocational Interest Blank: One form or two? *Journal of Counseling Psychology,* 1972, *19,* 404-410.

Lamb, R. R. Concurrent validity of the American College Testing Interest Inventory for minority group members (Doctoral dissertation, University of Iowa, 1974). *Dissertation Abstracts International,* 1975, *35,* 4161-A. (University Microfile No. 75-1216)

Prediger, D. J. The role of assessment in career guidance. In E. L. Herr (Ed.), *Vocational guidance and human development.* Boston: Houghton Mifflin, 1974.

Prediger, D. J. A world-of-work map for career exploration. *Vocational Guidance Quarterly,* 1976, *24,* 198-208. (a)

Prediger, D. J. The viability of Holland's consistency construct and raw score assessments of personality. *Measurement and Evaluation in Guidance,* 1976, *9,* 124-131. (b)

Prediger, D. J. Do raw scores deserve a D minus? A reply to Holland. *Measurement and Evaluation in Guidance,* 1976, *9,* 136-138. (c)

Prediger, D. J. Alternatives for validating interest inventories against group membership criteria. *Applied Psychological Measurement,* in press.

Prediger, D. J., & Cole, N. S. Sex-role socialization and employment realities: Implications for vocational interest measures. *Journal of Vocational Behavior,* 1975, *7,* 239-251.

Prediger, D. J., & Hanson, G. R. The distinction between sex restrictiveness and sex bias in interest inventories. *Measurement and Evaluation in Guidance,* 1974, *7,* 96-104.

Prediger, D. J., & Hanson, G. R. Holland's theory of careers applied to women and men: Analysis of implicit assumptions. *Journal of Vocational Behavior,* 1976, *8,* 167-184.

Prediger, D. J., & Hanson, G. R. Some consequences of using raw score reports of vocational interests. *Journal of Educational Measurement,* in press.

Rayman, J. Sex and the single interest inventory: The empirical validation of sex-balanced interest inventory items. *Journal of Counseling Psychology*, 1976, *23*, 239-246.

Roe, A. *The psychology of occupations*. New York: Wiley, 1956.

Roe, A., & Klos, D. Occupational classification. *Counseling Psychologist*, 1969, *1*(3), 84-92.

Schlossberg, N. K., & Goodman, J. Imperative for change: Counselor use of the Strong Vocational Interest Blanks. *Impact*, 1972, *2*, 25-29.

Schussel, R. H. The use of factor analysis and other multivariate techniques to improve the measurement of vocational interests among community college students and to develop an empirically derived personality inventory constructed from vocational interest items (Doctoral dissertation, Temple University, 1975). *Dissertation Abstracts International*, 1975, 36/06, 3013-B. (University Microfilms No. 75-28,243)

Tilton, J. W. Measurement of overlapping. *Journal of Educational Psychology*, 1937, *28*, 656-662.

Whitney, D. R. Predicting from expressed vocational choice: A review. *Personnel and Guidance Journal*, 1969, *48*, 279-286.

REFERENCE NOTE

1. Hanson, G. R. *The career interests of men and women in the same college majors*. Manuscript in preparation, 1976.

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